

PATENT
Case No. N0190US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: COMPUTER GAME DEVELOPMENT
FACTORY SYSTEM AND METHOD

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1 COMPUTER GAME DEVELOPMENT
2 FACTORY SYSTEM AND METHOD

3 REFERENCE TO RELATED APPLICATIONS

4 The present application is related to copending patent applications entitled
5 "METHOD AND SYSTEM FOR USING GEOGRAPHIC DATA IN COMPUTER
6 GAME DEVELOPMENT" Attorney Docket No. N0184US, "APPLICATION
7 PROGRAMMING INTERFACE FOR GEOGRAPHIC DATA IN COMPUTER
8 GAMES", Attorney Docket No. N0185US, and "GEOGRAPHIC AREA TEMPLATES
9 FOR COMPUTER GAMES", Attorney Docket No. N0186US, the entire disclosures of
10 which are incorporated by reference herein.

11
12 BACKGROUND OF THE INVENTION

13 The present invention relates to a system and method that facilitate development
14 of computer games and more particularly, a system and method that facilitate
15 development of computer games that include representations of geographic areas,
16 including such features as the road networks in the geographic areas.

17 Computer games have developed in sophistication and commercial importance.
18 Improvements in computer hardware and software have enabled computer games to
19 provide realistic graphics and sound. With these advances, computer game users have
20 come to expect that games meet high standards for richness and attention to detail. Some
21 computer games, such as road race games, represent real world places as part of the
22 playing scenarios of the games. With these types of games, users expect convincing
23 depictions of the real world with attention to accuracy and detail.

24 Computer game developers have recognized the need to provide realistic
25 depictions of actual real world places in computer games. This has placed a burden on
26 computer game developers to obtain the data needed to portray geographic places with
27 realistic detail and accuracy. The collection of such detailed geographic data about real

1 world roads, places, etc., is time-consuming and expensive. Further, the collection of
2 detailed real world data diverts the resources of computer game developers away from
3 other important aspects of computer game creation, such as characters, story lines, and
4 strategies. Thus, there exists a need to facilitate the collection and use of geographic data
5 by game developers.

6 Another consideration related to the development of computer games that depict
7 geographic places relates to providing a variety of different locales. Even if a computer
8 game developer collects all the data needed to depict a particular real world locale (such
9 as a city) with the richness and detail expected by game players, the game play scenario
10 is limited to only that particular locale. This may limit the appeal of the computer game.
11 Therefore, it may be advantageous for a computer game developer to provide games that
12 depict a variety of different real world locales. However, if a computer game developer
13 wants to provide a game with different real world locales, the developer is required to
14 collect geographic data for each different locale, thus incurring further considerable
15 expense.

16 Still another consideration related to the development of computer games that
17 depict geographic places concerns providing games on a variety of different hardware
18 platforms. There exist a variety of different hardware platforms on which computer
19 games are played. These different hardware platforms have different resources, such as
20 memory, processor speed, user interface, etc. In addition, there are multi-player games
21 that can involve a variety of different platforms intended to work together. Developing
22 games that utilize the available resources of different computer platforms also presents a
23 challenge to game developers.

24 Accordingly, it is an objective to provide ways to make computer games that
25 represent actual real world places.

26 It is another objective to facilitate the representation of actual physical real world
27 places or imaginary places in computer games.

28 29 SUMMARY OF THE INVENTION

30 To address these and other objectives, the present invention includes a system and
31 method for facilitating development of computer games that depict or represent actual

1 geographic locales or imaginary locales as part of the play scenarios of the games. A
2 computer game factory system includes inventories of map data products, road models,
3 3D models, game shells, and game engines. Configuration parameters identify which
4 components to select from the inventories to produce computer games for various
5 different computer platforms. The selected components are combined with a geographic
6 data API and geographic data tools to produce computer games.

8 BRIEF DESCRIPTION OF THE DRAWINGS

9 Figure 1 is a diagram that illustrates a relationship between a master version of a
10 geographic database and a coverage area.

11 Figure 2 is a block diagram showing a first embodiment of a system for
12 facilitating use of geographic data in developing computer games.

13 Figure 3 is a block diagram showing components of a system used by the
14 computer game developer of Figure 2.

15 Figure 4 is a flowchart showing steps in a process for making the map data
16 products shown in Figure 3.

17 Figure 5 is a flowchart showing steps in a process for making computer games
18 using the system of Figure 3.

19 Figure 6 is a block diagram showing components of the computer game produced
20 by the process of Figure 5.

21 Figure 7 is a flowchart showing an embodiment of a process for making computer
22 games using the system of Figure 3.

23 Figure 8 is a flowchart showing another embodiment of a process for making
24 computer games using the system of Figure 3.

25 Figure 9 is a flowchart showing yet another embodiment of a process for making
26 computer games using the system of Figure 3.

27 Figure 10 is a block diagram showing components of an alternative embodiment
28 of a system used by the computer game developer of Figure 2 for making computer
29 games.

30

1 DETAILED DESCRIPTION OF THE
2 PRESENTLY PREFERRED EMBODIMENTS

3 I. SOURCE GEOGRAPHIC DATABASE

4 The embodiments disclosed herein relate to computer games that depict real or
5 imaginary geographic locales as part of the play scenarios of the computer games. For
6 example, the play scenarios may involve a car chase through the streets of Miami,
7 Florida, a treasure hunt through the countries of Europe, a flight simulator game over
8 Texas, and so on. Game play scenarios may also involve imaginary places, such as a
9 southern California-style city. Game play scenarios may also involve playing in real
10 world places in time periods other than the current (e.g., London 1500 A.D. or Chicago
11 2150 A.D.). In the embodiments disclosed herein, geographic data used in the computer
12 games is obtained from a map data developer (also referred to as a “geographic database
13 developer” or the like). In these embodiments, the map data developer collects, confirms,
14 updates, processes and distributes geographic data for other, non-game related purposes,
15 such as navigation-related purposes.

16 Figure 1 shows a master or source version of a geographic database 100. The
17 master version of the geographic database is owned and developed by a geographic
18 database developer 101. (Although only one source database and geographic database
19 developer are shown, the embodiments disclosed herein are not limited to only a single
20 source database or a single geographic database developer.) The master version of the
21 geographic database 100 contains data 102 (also referred to a “geographic data” or
22 “spatial data”) that represent geographic features in a coverage area 104. The coverage
23 area 104 may correspond to an entire country, such as the United States. Alternatively,
24 the coverage area 104 may correspond to several countries, such as the United States,
25 Canada, and Mexico, or France, Germany, and Italy, and so on. According to another
26 alternative, the coverage area 104 of the master version of the geographic database 100
27 may represent only a single region within a country, such as the West Coast or the
28 Midwest of the U.S. Although the master version of the geographic database 100
29 includes data that represent geographic features in the entire coverage area 104, there
30 may be parts of the coverage area 104 that contain geographic features that are not

1 represented by data in the geographic database, or for which the representation of
2 geographic features is sparse.

3 The master version of the geographic database 100 includes data about a road
4 network 120 located in the coverage area 104. The data about the road network 120
5 include various kinds of information, such as the geographic coordinates of positions of
6 the roads, street names of the roads, addresses ranges along the roads, turn restrictions at
7 intersections of roads, and so on. The master version of the geographic database 100 also
8 includes data about points of interest in the covered area 104. Points of interest may
9 include hotels, restaurants, museums, stadiums, offices, automobile dealerships, auto
10 repair shops, etc. The master version of the geographic database 100 may include data
11 about the locations of these points of interests. The master version of the geographic
12 database 100 may also include data about places, such as cities, towns, or other
13 communities, and other geographic features, such as bodies of water, mountain ranges,
14 etc. The master version of the geographic database 100 may include other kinds of
15 information.

16 There are different ways used by the geographic database developer to collect
17 data. These ways include obtaining data from other sources, such as municipalities. In
18 addition, the geographic database developer may employ field personnel to travel by
19 vehicles along roads throughout the geographic region to observe features and record
20 information about them. The data collected by the geographic database developer are
21 stored in the master version of the geographic database 100.

22 The geographic database developer 101 continues to collect data that represent the
23 features in the geographic coverage area 104 on an ongoing basis. One reason that the
24 geographic database developer continues to collect data is that the features in the
25 coverage area 104 change over time. Accordingly, the geographic database developer
26 collects data about the same features in order to update or confirm the previously
27 collected data about the features. Another reason that the geographic database developer
28 continues to collect data is to expand the coverage and/or detail of the master version of
29 the geographic database 100. For example, at one point in time the master version of the
30 geographic database 100 may include data that represents only a portion of the entire
31 coverage area 104. After that point in time, the geographic database developer collects

1 data about features in areas that were not previously represented in order to expand the
2 coverage of the master version of the geographic database 100.

3 The master version of the geographic database 100 is maintained as the copy that
4 has the most up-to-date data relating to the coverage area 104. Accordingly, the master
5 version of the geographic database 100 is updated, expanded, and/or otherwise modified
6 on a regular and continuing basis. To facilitate these operations, the master version of the
7 geographic database 100 is stored in a format that facilitates updating, maintenance, and
8 development. For example, the data in the master version 100 may be uncompressed.
9 Examples of suitable formats include the VSAM format and the GDF format, although
10 other kinds of formats, both proprietary and non-proprietary, may be suitable. In general,
11 the format of the master database 100 is not suitable for use in navigation systems.

12 A copy of the master version of the geographic database 100 is physically located
13 at a first location 114. In one embodiment, the master version of the geographic database
14 100 is stored on one or more hard drives, tapes or other media, and accessed with an
15 appropriate computer 116. Any suitable computer may be used, such as a mainframe
16 computer, a plurality of networked microcomputers, etc.

17 Referring to Figure 2, the master version of the geographic database 100 is used
18 to make database products 110 for navigation purposes and database products 118 for
19 computer games. The database products 110 and 118 are made using a compiler 111.
20 The compiler 111 is a software program run on an appropriate computer platform. In the
21 present embodiment, the database products 118 used for computer games are made using
22 the same compiler used to make geographic databases 110 used for navigation purposes.
23 In alternative embodiments, separate compilers are used to make the map database
24 products 110 used for navigation purposes and the map database products 118 used for
25 computer games.

26 The database products 110 and 118 may include only portions of all the data in
27 the master version of the geographic database 100. For example, the database products
28 110 and 118 may include data that relate to only one or more specific sub-areas within
29 the coverage area 104 of the master version of the geographic database 100. Further, the
30 database products 110 and 118 may include fewer than all the data attributes that describe
31 geographic features represented in the master version of the geographic database 100.

1 The database products 110 and 118 are used on various kinds of computing
2 platforms. The computing platforms 112 used for navigation purposes include in-vehicle
3 navigation systems, hand-held portable navigation systems, personal computers
4 (including desktop and notebook computers), and other kinds of devices, such as personal
5 digital assistant (PDA) devices, pagers, telephones, cell phones, etc. The compiled
6 database products 110 are also used on networked computing platforms and
7 environments, including systems connected to the Internet.

8 The database products 110 that are used for navigation purposes are stored on
9 suitable media in their respective computing platforms. For example, the database
10 products 110 may be stored on CD-ROM disks, hard drives, DVD disks, flash memory,
11 or other types of media that are available now or that become available in the future.

12 On the computing platforms 112 used for navigation, the database products 110
13 are used by various software applications. For example, the database products 110 may
14 be used by software applications that provide navigation-related functions, such as route
15 calculation, route guidance, vehicle positioning, map display, and electronic yellow
16 pages, as well as other kinds of functions.

17 As stated above, in addition to producing database products 110 for use in
18 computing platforms used for navigation, the geographic database developer 101
19 produces database products 118 for use in computer games. The database products 118
20 are provided to one or more computer game developers 130 (only one of which is shown
21 in Figure 2). The database product 118 used by the computer game developer 130 may
22 be the same or similar to the database products 110 used for navigation. The database
23 products 118 used by the computer game developer 130 may be provided on a suitable
24 media, such as one or more CD-ROM disks, DVD disks, or hard drives. Alternatively,
25 the database products 118 used by the computer game developer 130 may be provided
26 over a network connection.

27 The computer game developer 130 uses data from the geographic database
28 products 118, along with other data and components (as explained below), to create one
29 or more computer games 132. The computer games 132 created by the computer game
30 developer 130 may include some or all the data from the database products 118.
31 Alternatively, the computer games 132 may include data derived from or based on the

1 data from the database products 118. The geographic data in the computer games 132
2 may be in a different format than the data contained in the database products 118.

3 The computer games 132 created using the data from the database products 118
4 provide for representing geographic features in play scenarios of the computer games.
5 The geographic features represented in the computer games 132 produced using the
6 database products 118 include features located in the respective coverage areas of the
7 database products 118. These geographic features may include some or all the road
8 networks represented by the geographic databases 118. The computer games 132 are
9 installed on appropriate computer platforms 134. The computer platforms 134 on which
10 the computer games 132 are installed may include personal computers, game consoles,
11 PDAs, handheld game devices, mobile phones, networked computers, and so on. Users
12 access the computer games 132 on the computer platforms 134 to play.

14 II. COMPUTER GAMES FACTORY SYSTEM

15 Figure 3 shows a system 150 used by the computer game developer (130 in Figure
16 2) for creating computer games 132 that use geographic data to depict locales as part of
17 the playing scenarios of the games. In Figure 3, the game development system 150
18 includes several inventories. In the embodiment of Figure 3, the game development
19 system 150 includes a map products inventory 160, a road models inventory 178, a 3D
20 models inventory 180, a game shells inventory 190 and a game engines inventory 200. In
21 addition, the game development system 150 includes a platform configuration parameters
22 repository 210.

23 The map products inventory 160 includes the database products 118 for games
24 provided by the map data developer 101. In the embodiment of Figure 3, the map
25 products inventory 160 includes a plurality of the different map database products 118.
26 The map database products 118 include representations of geographic features in
27 different locales. The types of geographic features that are represented include, for
28 example, the road networks, points of interest, lakes, administrative boundaries, and other
29 geographic features. In the embodiment of Figure 3, the map products inventory 160
30 includes separate map products 118 (i.e., geographic databases) that represent the road
31 networks and other geographic features in different geographic locales. For example, the

1 map products inventory 160 includes geographic database products that represent the
2 different locales of New York, Chicago, Los Angeles, and Paris. (There may be map
3 products that represent various other locales in addition to these.) Furthermore, for some
4 of the locales, the map products inventory 160 includes separate map products that
5 represent features in that locale differently. For example, for some of the locales there
6 are separate database products that represent the features with high accuracy, with
7 medium accuracy, with low accuracy, for pedestrians, for aircraft, and for bicycles.
8 (There may be map products that represent various other types in addition to these.) The
9 high accuracy database products include a relatively large amount of detail about the
10 geographic features in the respective locales and also represent the geographic features
11 relatively accurately. The medium accuracy database products include a relatively lesser
12 amount of detail about the geographic features in the respective locale and represent the
13 features with a relatively lower accuracy. The low accuracy database products include an
14 even lesser amount of detail about the geographic features in the respective locale and
15 represent the features with an even relatively lower accuracy. The pedestrian database
16 products include geographic data pertinent to travel on foot in the respective locale. For
17 example, the pedestrian map database products include information about sidewalks,
18 footpaths, hiking trails, etc., but may not include information about expressways. The
19 aircraft database products may include information about terrain, airport runways,
20 building heights, etc., but may exclude street names, address ranges, etc. The bicycle
21 database products may include information about bike paths, etc., but exclude airport
22 runways. As stated above, there may be map products for many other locales and many
23 other types of map products in the map products inventory 162.

24 Figure 4 shows a process 166 for forming the different map database products 118
25 used for computer games. In the present embodiment, the process 166 is performed by
26 the map developer 101. Alternatively, the process 166 may be performed by the game
27 developer 130 or by another party.

28 In a first step of the process 166, a geographic locale is selected (Step 168). The
29 locale may be a metropolitan area, a state, province, or country. Alternatively, the locale
30 may be an arbitrarily defined area, e.g., an area defined by specified geographic
31 boundaries.

1 After the locale is selected, a type is selected (Step 170). The type may include
2 standard (auto), pedestrian, aircraft, bicycle, etc. Other types may be defined.

3 After the type is specified, an accuracy level is selected (Step 172). Levels may
4 be specified in general terms (e.g., "high", "medium" or "low") or specific terms (e.g., 1
5 meter, 5 meter, 100 meter).

6 Once the locale, type, and accuracy levels are specified, data are retrieved from
7 the master geographic database 100 that match the specified criteria (Step 173). For
8 example, a spatial query is used to identify and retrieve data records that represent
9 geographic features located in the specified locale. Similarly, other queries are used to
10 limit the retrieved data to only those records of the specified type and accuracy.

11 Once the data that meet the specified criteria have been obtained from the master
12 database 100, the data are organized into an appropriate format (Step 174). This may
13 include compiling the data into a format in which it can be accessed and used in a
14 computer game running on a given hardware platform. This process may include the
15 formation of new types of data, the addition of indexes, parcelization, spatial organization
16 and compression. Processes for forming a compiled database product are described in
17 U.S. Pat. Nos. 5,974,419, 5,953,722, 5,968,109 and 6,047,280, the entire disclosures of
18 which are incorporated by reference herein.

19 (In addition to including map database products that represent actual, real world
20 locales, the map products inventory may include map products that represent imaginary
21 locales. These imaginary locales may be produced using the embodiments described in
22 the copending application entitled "GEOGRAPHIC AREA TEMPLATES FOR
23 COMPUTER GAMES", Attorney Docket No. N0186US, the entire disclosure of which
24 is incorporated by reference herein.)

25 Referring again to Figure 3, the game factory system 150 also includes the road
26 models inventory 178. The road models inventory 178 includes a plurality of road model
27 databases. The data in the road model databases include representations used for visual
28 appearance and rendering of road-related things, such as road colors, road pavement, lane
29 stripes, curbs, sidewalks, signs, lampposts, lane dividers, traffic signals, speed bumps,
30 crosswalks, and so on. When forming a computer game, these road model
31 representations are associated with the data representation of the road network obtained

1 from one of the geographic databases 118. The reason for this is that the data in the
2 geographic database 118 is (or is derived from) a representation of a road network used
3 for navigation. As such, the data in the geographic database 118 may not indicate what
4 roads, or things associated with a road, look like. For example, in the geographic
5 database 118, a data representation of a road may indicate the locations (e.g., geographic
6 coordinates) of intersections, and possibly the locations of points along a road segment
7 between intersections, the legal (and illegal) connections between roads, the names of
8 roads, the addresses ranges along roads, the type of road surface, and so on. However, in
9 the geographic database 118, a data representation of a road may not contain information
10 that indicates the actual visual shapes, colors, dimensions, etc., of these road-related
11 things. For example, in the geographic database 118, a data representation of a road may
12 not indicate the colors of a road, curbs, sidewalks, what a sign looks like, and so on. The
13 road model databases include these types of information.

14 The data representations of road-related things in the road models database are
15 also used for providing other properties of the represented things, such as the physical
16 and audio properties. For example, causing a simulated vehicle to move over a simulated
17 curb causes the simulated vehicle to “bump.” Similarly, a simulated vehicle “hitting” a
18 simulated lamppost causes a simulated crashing sound.

19 Each road model database may include a variety of different data models for some
20 types of road-related things. For example, a road models database include several
21 different types of traffic signal configurations. These different types of traffic signal
22 configurations are used to provide variety and to make the representation of the road
23 network appear more realistic, i.e., so that all the traffic signal configurations do not look
24 the same.

25 The road models inventory 178 includes a plurality of different road model
26 databases. Each of these different road models databases includes models that are
27 appropriate for a different type of locale. For example, a road models database for
28 London will include data models for the way road signs look in London, whereas a road
29 models database for New York will includes data models for the way road signs look in
30 New York. Similarly, a road models database for an aircraft simulator game will include

1 models for the way airports look from overhead, whereas a road models database for a
2 pedestrian game will include data models for the way an airport looks on foot.

3 The 3D model inventory 180 includes a plurality of 3D model databases. The 3D
4 model data in the 3D model databases includes representations used for visual appearance
5 and rendering of cityscape and landscape-related things, such as buildings, fences, trees,
6 shrubbery, lawns, fences, clouds, scenery, and so on. Like the road models, these 3D
7 model representations are associated with locations along the road network data as
8 represented by data from the geographic database 118. Furthermore, like the road models
9 databases, there are a plurality of 3D models databases that include 3D models
10 appropriate for different types of locales. For example, a 3D models database for Paris
11 will include 3D data models for the way buildings look in Paris, whereas a 3D models
12 database for Texas will include data models for the way buildings look in Texas.

13 The data representations of cityscape and landscape-related things in the 3D
14 models database are also used for providing the other properties (e.g., physical and audio)
15 of the represented things. For example, causing a simulated vehicle to strike a simulated
16 building causes the simulated vehicle to stop and make a crashing sound. As another
17 example, a simulated vehicle can drive over a simulated shrub, but not a simulated tree.

18 The game shells inventory 190 includes a plurality of different game shells. A
19 game shell is a data structure and/or program that includes the basic logic, rules, strategy,
20 characters, vehicles, etc., for a game. In the embodiment of Figure 3, the game shells
21 include a road rally game shell, a police chase game shell, a location quiz game shell, a
22 “bot” fighter game shell, a flight simulator game shell, a “first-person-shooter” game
23 shell, an auto theft game shell, and an urban development simulator game shell. There
24 may be other type of game shells in addition to these.

25 The game factory system 150 also includes a game engines inventory 200. The
26 game engines inventory 200 includes a plurality of different game engines. Game
27 engines are software programs (e.g., including applications or routines and/or their
28 associated libraries) that are included inside (made a part of) the computer game. In
29 general, the game engines perform specific, regularly performed tasks and operate on an
30 as-needed basis (e.g., continuously) during game play. A game engine program may run
31 continuously waiting to receive some input (e.g., from another program, from a game

1 player, etc.) and, in response to the input, may change some output. Examples of game
2 engines include audio engines, logic engines, rules engines, animation engines, graphics
3 engines, user interface engines, navigation engines (application) and so on. The game
4 engines inventory 200 includes several different engines of a given type. For example,
5 there are several different audio engines, several different graphics engines, etc. The
6 navigation engines include applications that make specific use of geographic data, such
7 as a route calculation application that determines a route for part of a play scenario of the
8 game. Each of these different engines of a given type is suitable for a different kind of
9 computer platform and/or game shell. For example, an audio engine for a game to be
10 played on a personal computer may be more robust and sophisticated than an audio
11 engine for a game to be played on a cell phone. Even though there may be several
12 different engines of a given type, each of these different engines of a given type may
13 share some components, functions, etc.

14 The game factory system 150 also includes the platform configuration parameters
15 repository 210. The platform configuration parameters repository 210 includes a
16 plurality of entries specifying configuration parameters for different computer platforms.
17 Figure 3 shows several general categories of computer platforms in the platform
18 configuration parameters repository 210. These general categories include PC (personal
19 computers), game consoles, cell phones, hand held devices, and networks. (The platform
20 configuration parameters repository 210 may include additional categories.) Within each
21 category, the platform configuration parameters repository 210 includes entries for
22 different computer platforms of the type corresponding to that category. Each entry
23 matches an associated computer platform with one or more game shells, one or more map
24 product types, one or more game engines, one or more road models, and one or more 3D
25 models. Each of the entries in the platform configuration repository is matched with
26 suitable components from each inventory based on the hardware and software resources
27 of the associated platform.

28

29 III. OPERATION OF THE COMPUTER GAMES FACTORY SYSTEM

30 Figure 5 shows a process 300 for forming a computer game using the game
31 factory system 150 of Figure 3. In this embodiment, the process 300 is performed by the

1 computer game developer (130 in Figure 2) but in alternative embodiments the process
2 may be performed by another party. The process 300 may be performed automatically
3 (e.g., by a computer program) or may be performed manually by a human operator (who
4 may be operating a computer) or by a combination of automatic steps and manual steps.

5 In a first step of the process 300, a game type is selected (Step 304). The game
6 type is selected from the types for which a game shell exists in the game shells inventory
7 190 in Figure 3. The game shell data structure corresponding to the selected type is
8 retrieved from the game shells inventory 190 (Step 308).

9 Next, a locale is selected (Step 312). The locale is selected from the available
10 locales represented by map products in the map products inventory 160 in Figure 3.

11 Next, a platform is selected (Step 316). The platform is selected from the
12 available platforms listed in the platform configuration parameters repository 210 in
13 Figure 3. The entry in the platform configuration parameters repository 210 that
14 corresponds to the selected type of platform is retrieved (Step 320).

15 Based on the parameters information in the platform configuration entry about the
16 requirements of the selected platform and the selected locale, appropriate selections are
17 retrieved from the map database inventory 160, the road models inventory 178, the 3D
18 models inventory and the game engines inventory 200 (Step 324). In addition to these
19 selections, a geographic data API (application programming interface) 332 and
20 geographic tools programs 333 are retrieved (Step 330). These components are
21 combined (e.g., compiled and/or linked together) to form the computer game 132 (Step
22 336). In the computer game product, the geographic data may be integrated into the code
23 base or may exist separately. The computer game 132 is distributed (and/or sold or
24 licensed) to end users (Step 340).

25 26 IV. COMPUTER GAME STRUCTURE AND OPERATION

27 A. Overview

28 Figure 6 shows components of the computer game 132 produced by the process
29 300 of Figure 5. The components in Figure 6 were selected from the appropriate
30 inventories during the process 300 of Figure 5 and combined (e.g., compiled and/or
31 linked) to form the computer game software program 132 in Figure 6.

1 In Figure 6, game engines are provided for basic game play operations, including
2 audio, graphics, rules, logic, animation, and user interface. There may be more engines
3 in addition to these. The engines operate in accordance with input from the game shell,
4 which provides the characteristics of the game that uniquely identify the game. Operation
5 of the engines is also modified by the user who provides input via a user interface of the
6 game.

7
8 B. Geographic data API

9 During playing scenarios, geographic data in the game is accessed. The
10 geographic data is obtained from the geographic database 118, which had been obtained
11 from the map products inventory 160 during formation of the game. (Note that the
12 geographic data may be in a different format or structure after it has been included in the
13 computer game.) The geographic data API 332 is used by a requesting game engine to
14 obtain needed geographic data from the geographic database. In general, the geographic
15 data API 332 provides a structured, relatively high-level interface by which the game
16 engines can request geographic data. In one embodiment, the geographic data API
17 provides a set of function calls and queries in a programming language, such as C, by
18 which the game engines can request geographic data. In one embodiment, the geographic
19 database API 332 is similar or identical to the interface layer described in U.S. Pat. No.
20 6,047,280, the entire disclosure of which is incorporated by reference herein.

21 Among the functions provided by the geographic data API is a spatial query
22 function 350. The spatial query function 350 returns data records of a specified type
23 (e.g., data that represent road segments) based on location criteria included in the query.
24 For example, a spatial query may request all the data records that represent road segments
25 that are within 5 km of a given latitude and longitude. Another spatial query may request
26 all the data records that represent restaurants that are within a rectangular area having
27 specified geographic boundaries. The spatial search function 350 in the geographic data
28 API 332 returns to the requesting component (e.g., a game engine) the data records that
29 meet these criteria.

30

1 C. Geographic data tools

2 In addition to the geographic data API 332, one or more sets of geographic tools
3 333 are also included in the computer game 132. The geographic data tools 333 are used
4 in combination with the geographic data API to manage and process geographic data
5 accessed from the geographic database.

6
7 1. Integration

8 One of the functions provided by the geographic tools programs 333 is an
9 integration function 352. The integration function 352 provides for associating data from
10 the road model database with data from the geographic database 118 that represents the
11 road network. The integration function 352 may associate road model data with specific
12 locations along a road segment (as represented by data from the geographic database 118)
13 or with lengths along a road segment. As an example, the integration function 352 may
14 provide for showing curbs (using a model for what a curb looks like from the road model
15 database) along all side streets (represented by data from the geographic database 118).
16 In another example, the integration function 352 may provide for showing barriers along
17 all the sides of expressways (using a model for barriers from the road model database) as
18 represented by data from the geographic database 118. The integration function 352 may
19 also provide for associating data models for traffic signals at intersections.

20 The computer game uses the integration function 352 in the geographic tools
21 programs 333 to combine data from the road model database with data from the
22 geographic database 118 to provide a realistic appearing road network. The road model
23 database is not necessarily intended to represent actual road-related things, such as the
24 exact locations of or text on signs, or the exact configuration of traffic signals, etc.
25 Neither the geographic database 118 nor the road model database may contain
26 information that represents the actual location of signs or the exact configuration of
27 traffic signals. However, the road model database provides data for visually representing
28 these road-related things in a manner that would be typical for the geographic area. So,
29 for a residential neighborhood, the road model database would include models for
30 sidewalks, cross walks, stop signs, etc., which would be associated with appropriate
31 locations along the road network as defined by the geographic database 118. The

1 integration function 352 and the road model database provide for both the density (how
2 many signs per mile or how many lampposts per block) and the style (shape, height, sign
3 text wording) of these road related things.

4 5 2. 3D conversion

6 The geographic data tools 333 also include a 3D conversion function 354. The
7 3D conversion function 354 supports conversion of the data obtained from the geographic
8 database 118 so that it can be displayed as a 3D (perspective view) image. The 3D image
9 may represent the geographic area from the point of view of the game player or may be
10 from the point of view of another, e.g., a spectator. The view may be an overhead view.

11 12 3. Other tools

13 In addition to the integration function and the 3D function, the geographic tools
14 may include other functions for handling the geographic data retrieved from the
15 geographic database through the geographic data API.

16 17 V. ALTERNATIVE EMBODIMENTS FOR OPERATION

18 The embodiments disclosed herein provide for the efficient and flexible
19 development of a variety of different computer games. The embodiments enable
20 developing computer games for a variety of platforms. The embodiments also provide
21 for ways of meeting the expectations and desires of users who want different kinds of
22 games. Further, the embodiments provide for ways of meeting the desires of users who
23 want to choose a particular locale for a game playing scenario or change the locales.
24 Some of the ways in which the embodiments fulfill these expectations are set forth
25 below.

26 27 A. Selection of locales, platforms by game developer

28 Figure 7 is a flowchart that illustrates an embodiment 600 in which the game
29 developer determines which computer games to produce by selecting the combinations of
30 game types, platforms, and locales and then uses the game factory system to produce

1 computer games based on the selections. Then, the computer game developer offers the
2 games for sale to end users who purchase the games from the computer developer.

3
4 B. Selection of locales, platforms by end users

5 In the embodiment 700 of Figure 8, the game developer allows each end user to
6 choose a game type, a locale, and a platform. Then, based on the end user's selections,
7 the computer game developer uses the game factory system to produce the computer
8 game, which is then sold and delivered to the end user. According to one version of this
9 embodiment, the end user may, at a later time, obtain a different set of geographic data
10 for the previously purchased computer game. The different set of data may represent the
11 geographic features in a different locale. The different set of data would be provided
12 from the map products inventory in the game factory system to the end user. In the end
13 user's computer game, the new set of geographic data would be accessed using the same
14 geographic API and set of geographic tools programs. Changing the locale in this
15 manner may enhance the value of the game. (Alternatively, the geographic data in the
16 computer game may not be changeable, i.e., without replacement of the entire game.)

17
18 C. End user obtains game and geographic data separately

19 In the embodiment 800 of Figure 9, the computer game developer produces the
20 computer games, including the game engines, APIs, game tools, and game shells, but
21 without the geographic data. Then, the user separately selects the desired locale at the
22 time of purchase and obtains geographic data for the selected locale. The end user may
23 obtain the geographic data from the game developer or from another source, such as the
24 map developer. In the end user's computer game, the set of geographic data would be
25 accessed using the geographic API and set of geographic tools programs, as described in
26 the previous embodiments. As in the previous embodiment, one alternative enables the
27 end user, at a later time, to obtain a different set of geographic data for the previously
28 purchased computer game.

29

1 VI. OTHER ALTERNATIVE EMBODIMENTS

2 As mentioned above, the game development system includes a map products
3 inventory that contains maps for different locales and for different representations of the
4 geographic features in some of the locales. Some of the different locales represented by
5 map data products may overlap each other. For example, there may be separate map data
6 products for Los Angeles, California, and the United States.

7 In the embodiment of Figure 3, it was described how a game factory system
8 included a map products inventory that included a plurality of map databases that
9 represented different geographic locales or that represented some locales differently. In
10 an alternative embodiment, a game factory system includes a map database products
11 generator instead of (or in addition to) having a map products inventory. An embodiment
12 of a game factory 500 having a map products generator 520 is shown in Figure 10. The
13 embodiment of the game factory system 500 shown in Figure 10 is similar to the
14 embodiment shown in Figure 3 and like components are indicated by the same numerals
15 as in the previous embodiment.

16 In the embodiment of Figure 10, the game factory 500 includes (or uses) a
17 geographic database 526. The geographic database 526 may be the same as or similar to
18 the master version 100 of the geographic database shown in Figures 1 and 2, or
19 alternatively, may be a database derived from the master version 100 of the geographic
20 database. The map products generator 520 uses data from the geographic database 526 to
21 produce a map database product for use in a computer game during the process of
22 creating the computer game. The embodiment of Figure 10 has the advantage that the
23 need to maintain an inventory of map database products is reduced. In a further
24 alternative, the embodiment of Figure 10 may be combined with the embodiment of
25 Figure 3 so that a map database products inventory is maintained that contains some
26 products and a map generator is used to produce other map products.

27 The embodiments disclosed herein describe use of geographic data in computer
28 games. The embodiments disclosed herein can be adapted for using geographic data for
29 other non-navigation-related purposes. Among these other, non-navigation purposes are
30 simulations and movie making. For example, the embodiments disclosed herein can be
31 adapted for using geographic data for simulation systems. Simulation systems that can

1 use geographic data include systems that simulate emergency operations (such as
2 evacuation procedures or emergency vehicle deployment and routing), driver education
3 systems, etc.

4 The embodiments disclosed herein can also be used in movie making. Many
5 movies use compute-generated images of real (or imaginary) locations, instead of actual
6 images. The embodiments disclosed herein can be adapted for creating realistic-looking
7 geographic locations, including features such as road networks, for use in movie making.
8 When using any of the disclosed embodiments for movie making, a relatively high visual
9 accuracy may be required and therefore attributes that provide for relatively high visual
10 accuracy may be needed. However, fewer attributes of some types may not be required.

11 The embodiments disclosed herein can be used on various different types of
12 computer platforms, including client-server platforms and peer-to-peer platforms. The
13 embodiments disclosed herein can be used with streaming or other technologies.

14 The embodiments disclosed herein may also be used for games that use
15 geographic data obtained from multiple sources, e.g., more than one source geographic
16 database. In these embodiments, the data from the multiple source geographic databases
17 may be combined by the game developer or by another party.

18 In some of the embodiments disclosed above, it was described how a game
19 developer could use the game factory system to make various different kinds of games,
20 which could then be sold to end users. In an alternative embodiment, the game factory
21 system could be provided to end users to allow the end users to make various different
22 games for themselves.

23 24 VII. EXAMPLES

25 The following are examples of different types of computer games and/or
26 applications that can be developed using the disclosed embodiments. (Note that some of
27 the games are new and some are updates and/or improvements of prior games.)

28 29 A. City development simulation game

30 Geographic data that represents actual, real-world locales can be used in a type of
31 computer game in which players simulate growth of an urban (or other regional)

environment. In this kind of game, players simulate building cities or other places (such as towns, countries, rural areas) by designing roads, utilities (e.g., electrical, sewage, water) and other infrastructure elements for a geographic area. Then, the computer game allows a virtual city to develop based on the designs. The virtual cities can be detailed including individual zoning requirements (e.g., residential, commercial, industrial, etc.), crime layers (i.e., that can be changed by implementing police stations), traffic, unemployment and other realistic features.

Geographic data that represents actual, real-world locales can be used in this type of game to provide a high level of realism thereby allowing game players to build cities based on real world city models. In this type of game, players may choose a specific city model (e.g., Paris), and attempt to improve or replicate it. The inclusion of real time traffic, weather, points of interest (periodically updated or real time) and other real world content would serve to increase the realism of such a virtual city. This improvement could add realism, player loyalty, recognition, and an alternative goal to this popular type of game.

B. Virtual person development simulation game

Geographic data that represents actual, real-world locales can be used in a type of computer game in which game players simulate development of a virtual person (e.g., a “sim”). In this kind of computer game, players build a virtual person by managing that virtual person’s habits, tendencies, house, family, job and interactions with other virtual people. In prior simulation games of this type, the locales in which virtual people live were non-specific. In prior simulation games of this type, the locales were modeled from the view of the player’s virtual house and may have included some features specific to the game manufacturer.

Data from a source of geographic data that represents actual, real-world locales can be used in this type of game to provide a high level of realism, thereby allowing players to build virtual characters in models of real cities, with models of actual real-world points of interest, streets, landmarks and neighborhoods. When starting this type of game, which has been enhanced by the addition of geographic data that represents actual, real-world locales, a player chooses a real world city. Once the city has been

chosen, neighborhoods from the city become available for the player to select (e.g., Chicago's Gold Cost, Lincoln Park, Rogers Park, River North, or specific suburbs). Once the player selects a neighborhood, the player's virtual person would be able to simulate visits to virtual attractions based on real world local attractions, e.g., go to popular restaurants and bars, work in local businesses, and reflect how life is lived in that specific area almost as if he/she were living there.

C. "Bot-fighter" game

Geographic data that represents actual, real-world locales can be used as a backbone for a "bot-fighter"-type game. This enhances the bot-fighter-type game by incorporating detailed spatial data that represents real world locales. A "bot-fighter"-type game can be played on mobile phones. In this game, players build "warrior robots" on their mobile phones using credits (e.g., virtual money) from battles won against other players. All firing between warriors is done via SMS messaging over the mobile phones. With mobile phone technology, a player may be given rough coordinates to his or her player-enemies or be warned when a player-enemy has entered his/her area or turf via mobile phone positioning technology.

The addition of geographic data that represents actual, real-world locales can give this type of game greater appeal. Specific route data and location details or spotting could be provided instead of simple proximity alerts. The addition of geographic data that represents actual, real-world locales would enable this type of game to support more precise boundaries. Further, with the addition of geographic data that represents actual, real-world locales, a game player's weapons could be given more accurate range limitations, rather than rough limitations available with existing games.

In addition, game credits (e.g., virtual money) could be spent on routes, enemy interception (based on known movements or historical patterns) courses, or enemy spotting locations.

D. Traffic management game/application

In this computer game/application, data that represents the road network in the real world is used in combination with traffic feeds and models in order to simulate a real

1 city with its existing traffic patterns. Once a model of an actual city with its road network
2 and traffic patterns is created, predictive modeling and comparisons to other cities allow
3 the user to tweak, re-model, or re-design traffic architecture to improve the road network
4 with the objective to create the most efficient traffic system or to make the most
5 improvements to an existing system.

6 This computer game/application can include a vehicle fleet management feature.
7 According to this feature, the game player is given a virtual fleet of vehicles (e.g., starting
8 with two trucks) in an initially chosen city and an overlay of existing traffic conditions.
9 The goal of the game with the fleet management feature would be to provide service to a
10 customer base (i.e., based on real world businesses represented in the real world
11 geographic database and some zoning data). Time of day for delivery, fleet routing, fuel
12 expenditures, pickup points and schedules etc., would all be managed by the game player.

13 Traffic flow, incidents, bottlenecks and other traffic data would be displayed.
14 Wired or live devices would also have the ability to add live or updated data. Traffic
15 would be made up from individual vehicles, following typical vehicle movement patterns
16 (e.g., gapers, cars driving down the shoulder, etc.) or could be built from scratch.

17
18 E. Emergency services and law enforcement games

19 Geographic data that represents actual, real-world locales can be used in
20 emergency services scenario-type games or law enforcement scenario-type games. These
21 games include themes related to fire fighting, medical emergency services (e.g.,
22 ambulance, search and rescue), police chases, etc. Game developers who make these
23 kinds of games can use the disclosed embodiments to provide realistic looking locales,
24 possibly with the addition of location-based content (e.g., actual buildings, businesses
25 etc.), traffic, weather, points of interest, etc., as part of the playing scenarios of these
26 games.

27
28 F. Location quiz game

29 Geographic data that represents actual, real-world locales can be used in a
30 location quiz-type of computer game. In this type of game, game players are provided
31 with clues about a game character's secret location and attempt to determine the secret

geographic location. Using geographic data that represents actual, real-world locales adds a measure of realism to this type of game and increases its educational value.

One feature of this game is the ability to personalize the game to a player's locale. Players would be able to search for the secret location in their own city or neighborhood. For example, parents could use the game to teach their children how to get around in their own neighborhoods. According to this example, parents could set up the game to include the route that their child takes to and from school. Also, if a family moves to a new neighborhood, the parents could obtain up-to-date digital map data that represents the new neighborhood in order to teach their children about the new neighborhood.

Adding digital map data to the game would also provide the capability to play it anywhere the player is located. For example, a child from Chicago who is on vacation in Paris could search for the game character in Paris and thereby learn about the city.

G. Children's atlas

Another computer game/application that can use geographic data that represents actual, real-world locales is a children's atlas game/application. This computer game/application can be used by families on long car trips. In one embodiment, this game/application could be used to answer children's questions such as "Are we there yet?" or "Where are we?" with distances and times to destinations.

One version of this game includes a communications feature that allows a child to communicate with other children who have games with the same feature. Another version of this game/application allows a game player to create a virtual travelogue that describes and records travels in real time.

In one embodiment, a children's atlas game/application would be developed as a travel companion game that obtains location information from an in-vehicle navigation system or remote server. As a car in which the child is a passenger drives through a specific locale (e.g., a town or attraction) or a more general area (e.g., a state), the children's atlas application would display images and use voice narration to provide facts about the area. The children's atlas game/application would also provide well-known stories or legends about an area (e.g., Johnny Appleseed as the child is traveling through the Appalachians).

1 In another alternative embodiment, the children's atlas includes a travel pal
 2 feature. This feature allows a child traveling through an area to connect online with other
 3 children who located in the area. In one version of this feature, children can
 4 communicate with other traveling children or with other children located in the area a
 5 child is passing through using instant messaging. A buddy list may be formed and used
 6 for this purpose. Children could access this service while traveling or at home. For
 7 example, children could exchange information about their travels or play games.
 8 Children passing through a particular place could instant message with children living in
 9 the area and ask questions about the area, e.g., what do the locals think about the best
 10 places to eat, what is the best radio station, etc.

11 According to another alternative embodiment, the children's atlas application
 12 includes a virtual travelogue feature. The virtual travelogue feature allows a child to
 13 collect, store, and send information about his or her travels as a trip is taking place. The
 14 child could take information provided by the atlas game/application, annotate it with
 15 personal experiences and observations, and send it to friends and relatives, or to a home
 16 website that eventually turns into a scrapbook of the entire trip (or perhaps a report on a
 17 school field trip), complete with maps, pictures and postcards from the area, voice
 18 narration, and any other data collected along the way.

19 The virtual travelogue feature could also catalogue and automatically store every
 20 place the child has traveled. The child could then display or print out a map that shows all
 21 the places he or she has been and how he or she got there.

22

23 H. Simulated tour

24 Another application that can use geographic data that represents actual, real-world
 25 locales is a simulated tour application. This simulated tour application uses geographic
 26 data, POI data, 3D modeling, and other data, such as weather, traffic, crime statistics, and
 27 restaurant guides, to build a realistic view of a city or other locale for virtual touring. The
 28 simulated tour application could be used by people considering moving to a new area, or
 29 could be hosted by realtors, or used by travelers, or simply used by individuals to learn
 30 more about different locations.

1 With this application, one can learn, understand, explore, or market a specific
2 area. This application would portray an area visually, textually, and possibly even
3 audibly. Smells (e.g., heavy fog, chocolate factory nearby – pervasive) could be provided
4 using appropriate technology or described textually.

5 One use for this application is to provide a way for a person to become familiar
6 with driving in an unfamiliar city. Some cities may have driving conventions that are
7 unfamiliar to some people. For example, speed limits are painted on the road in
8 California and Hawaii whereas they are located on little signs in Illinois. According to
9 another example, traffic is particularly aggressive in Rome and lanes are viewed as
10 guidelines, not rules etc.

11 12 I. Car rally challenge game

13 Another computer game that can be improved using geographic data that
14 represents real world places is a car rally challenge-type game. This game can be played
15 in single player or multi-player versions. In this type of game, teams of game players
16 travel actual routes that are sent to them from a central server. The server would store a
17 number of car rally routes and attribute scenarios (e.g., points of interest as checkpoints)
18 for a specific area (e.g., state, city, neighborhood, etc.), and these virtual rally instructions
19 would be sent to the participating drivers and navigators.

20 An organizer's kit could also be offered that would cater to amateur car rally
21 organizations or clubs. The kit would allow an individual or organization to create a
22 customized car rally specific to a city or area. The rally information could be created on
23 the rally organizer's personal computer within a program, or via download from a
24 website. It could then be printed out and handed to the racers or downloaded to a device
25 such as a PDA.

26 The difference between the game and the kit is that the game would send out pre-
27 determined routes and rally features. The routes and features might change regularly but
28 the players would not have a hand in planning or creating the rally scenarios.
29 The kit would provide the basic tools and content to create a rally, thereby allowing the
30 user to add local flavor, degrees of difficulty, or to even recreate a well-known rally
31 course.

1
2 J. Location-based virtual monopoly game

3 Geographic data that represents real world places can be used in a computer game
4 based on the Monopoly board game. In one version of this game scenario, a game
5 player's positions and movements in the real world are tracked, using positioning
6 equipment such as GPS, cell phone triangulation, etc. These movements would be used
7 to define game routes for that player. Then, the routes would be used to identify
8 properties (e.g., actual or fictional) along that route the game player could virtually
9 purchase, rent, etc., as in the classic board game. Real world conditions, such as traffic
10 restrictions, road construction, tolls, etc., would be factored into the game play scenario.
11

12 K. Promotional games and contests

13 Geographic data that represents real world places can be used for promotional
14 concepts (e.g., contests, sales events, and so on). Businesses, such as retailers or
15 restaurant franchises, frequently use special promotions or contests to attract business.
16 Adding location-based data and services to these promotions would allow businesses to
17 better target, reach, and track potential customers, and also add an extra dimension.
18 Promotional tie-ins to location-based data could be developed using a variety of
19 approaches.
20

21 L. Spatial simulator for exercise

22 Data that represents actual, real world places can be used with sports or exercise-
23 related events or equipment. For example, geographic data can be used to enhance
24 simulators (e.g., monitors) used on or with exercise equipment. Geographic data that
25 represents real places can be used with a treadmill or exercise bicycle to simulate the
26 experience of running or biking along a route. The route would be projected on a
27 monitor or screen in front of the person on an exercise machine such as a treadmill or
28 exercise bicycle.

29 Use of data that represents actual, real world places could allow users to feel as if
30 they were running through the streets of a major city, e.g., along a marathon or 10K
31 route, or biking the route of the Tour de France. The simulator could also be used to keep

1 track of long-term training goals, such as running virtually across the entire United
2 States.

3 A basic simulation would consist of a display of a basic overview map based on a
4 route. For example, the user would ask for a route within a city and a basic map would
5 be displayed showing the streets of the city with a mark on the map indicating the virtual
6 position of the runner or bicyclist. The runner's progress along the route would be based
7 on the runner's pace. The degree or category of simulation offered could vary depending
8 on the level of realism desired. For example, details such as road elevation could be
9 added to the simulation. This would allow the person exercising to experience the feeling
10 of running or biking in the Rocky Mountains or through the plains of Nebraska.

11 A detailed simulation would use 3D data and give a full picture on a monitor of
12 the buildings and landmarks along the route. This would give the runner or bicyclist a
13 realistic feeling of running or biking along the route.

14
15 M. Classic computer games

16 Geographic data that represents actual, real-world locales can be advantageously
17 used to make new versions of classic computer games like Snake and Pacman. In these
18 new versions of these games, game players assume the identities of characters in the
19 game. A player uses positioning equipment that determines the player's actual physical
20 positioning the real world. The player also has equipment that provides for wireless
21 communication with a central database. This player becomes a virtual player in a classic
22 game such as PacMan or Snake. The games would be played in either an online
23 competitive mode or a single player (player versus machine) mode. In either case, the
24 player acts as a character in the game. The distance and speed moved by the player would
25 be translated to movement and speed in a virtual world, where the player may accomplish
26 goals within the game or defeat other players. The system would be set up in translated
27 "virtual boards" where a game would consist of an area regulated by the speed of
28 transportation (a "board" for a vehicle can be significantly larger than one for a
29 pedestrian).

30

1 N. Location based cannonball run car racing game

2 Another computer game that can use embodiments of the disclosed system and
3 method for providing geographic data is a “cannonball run” car racing game. This game
4 may be played in multi-player or single player mode. The multi-player mode game may
5 be played online. In the game playing scenario, players compete against each other to
6 race vehicles (e.g., cars, bikes, etc.) across a geographical area. Data that represent
7 actual, real-world places would be used to add realism to the game, e.g., actual legal and
8 physical restrictions. Alternative features include the addition of real-time traffic and
9 weather conditions.

10 One scenario for a multi-player online version of the game would feature a
11 community where players start out with a specific mode of transportation. This version
12 of the game would provide an online culture and goal of being with the best group and
13 driving the best vehicle. Players would start with a certain amount of virtual cash and a
14 basic vehicle. Some races would be pre-defined events, whereas other races would be
15 random city races with a user defined start and end points. The selection of routes for
16 races would be based on real map data. The game would be based on winning virtual
17 money by winning races, but winning a race could cost the player due to traffic tickets,
18 illegal traffic maneuvers or other expenses. All fines would be based on legal restriction
19 data and statistics of the percentage of drivers caught. Suggested routes would be
20 provided in all races, and the amount of virtual cash used to buy a route would vary the
21 quality or speed of the route.

22 Game players would have the option of racing through their hometowns, or
23 through the streets of their favorite cities or countries all over the world. These would
24 attract a larger demographic, and interest the casual game player as well.

25
26 O. Virtual trip planner and simulation

27 Data that represents actual, real world places can be used for a computer
28 simulation application that would allow a user to preview a trip or specific route by
29 virtually driving it on his or her personal computer or game console. The simulation
30 would be based on a representation of the geographic database that included 3D
31 renderings of buildings, signs, topographical features, and other related attributes. The

1 simulation software could be provided on media, through an online vendor, or rented to
2 users on an as-needed basis. Users would enter a route request via their personal
3 computers or consoles and could use gaming steering wheels, joysticks, voice commands,
4 or keyboards to drive the routes. A fast forward function could be used to skip the
5 obvious or mundane sections of the trip or to speed up the pace.

6 To make the simulation more realistic, traffic features, such as vehicles coming
7 and going on the route, could be included. These could perhaps even be based on actual
8 traffic patterns or real-time traffic for a selected time of day.

9 A feature of this simulation application would be as a form of trip planner. The
10 planner would provide information about an area to which one is traveling, such as local
11 history, area specific trivia games, and point of interest descriptions and
12 recommendations. Users would have the option of using this information while driving
13 the area in advance (e.g., using the simulation application, described above), printing out
14 the planner in advance as a reference, or loading it onto a device and accessing it during
15 an actual trip (e.g., going on a long trip and using the planner interactively to keep
16 children amused and informed). For example, if a family was traveling on vacation from
17 Chicago to Miami by car, the parents could research and preview the attractions, hotels,
18 and restaurants at which the family may want to stop along the way. They could also
19 preview the route and create their own form of trip ticket to plan the best route. The
20 parents could then set up an itinerary that would include games, information, quizzes etc.,
21 that would occupy the children throughout the trip.

22
23 It is intended that the foregoing detailed description be regarded as illustrative
24 rather than limiting and that it is understood that the following claims including all
25 equivalents are intended to define the scope of the invention.

26